BR 3569. DP

(21)

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :
B21D 51/50, B65D 41/04

A1

(11) International Publication Number: WO 94/20237

(43) International Publication Date: 15 September 1994 (15.09.94)

(21) International Application Number: PCT/GB94/00341

(22) International Filing Date: 21 February 1994 (21.02.94)

(30) Priority Data:
9304493.1 5 March 1993 (05.03.93) GB

(71) Applicant *(for all designated States except US)*: MCG CLOSURES LIMITED [GB/GB]; P.O. Box 32, Bromford Lane, West Bromwich, West Midlands B70 7HY (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: COX, Malcolm, Alan [GB/GB]; 59 Melrose Avenue, Sutton Coldfield, West Midlands B73 6NS (GB).

(74) Agents: STEBBING, P., J., H. et al.; Ablett & Stebbing, 45 Lancaster Mews, Lancaster Gate, London W2 3QQ (GB).

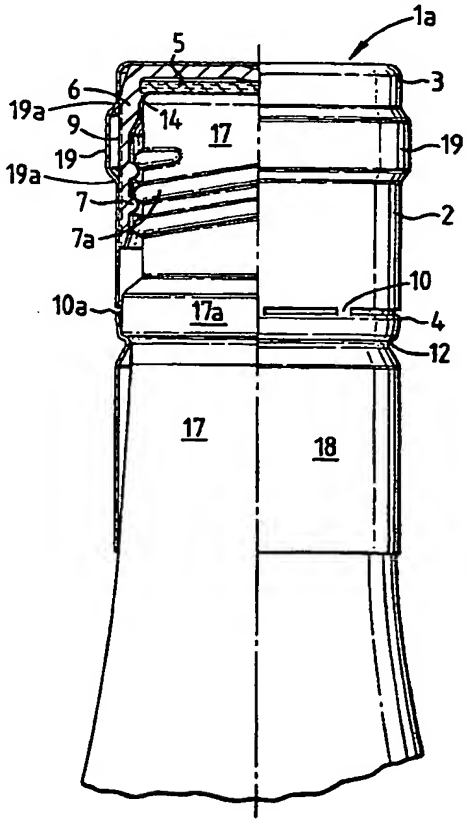
(81) Designated States: AU, CA, JP, NZ, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: CLOSURE WITH PLASTICS INSERT

(57) Abstract

The invention provides a process for forming a container closure with a plastics insert (6) which process comprises providing a drawn metal closure outer (1) preferably formed of aluminium and provided with a crown (3) and a depending skirt (2) and having an internal diameter, providing a plastics insert (6) formed of a material having an elastic memory such as a polyalkylene, similarly provided with a crown or/and a depending skirt, said plastics insert having a maximum diameter which is an interference fit within the internal diameter of the closure outer, which process comprises delivering the closure outer (1) and the insert (6) to stations which are generally coaxially disposed, compressing (25) the insert to reduce its diameter and projecting the inserts in its compressed state into the closure outer to firmly seat therein and subsequently allowing said insert to decompress to its original diameter in situ. The arrangement provides a facile means of locating a plastics insert in a drawn aluminium outer such that mutual rotation between the skirt portions of the outer and the plastics insert cannot occur during use.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GB**	United Kingdom	**MR**	Mauritania
AU	Australia	**GE**	Georgia	**MW**	Malawi
BB	Barbados	**GN**	Guinea	**NE**	Niger
BE	Belgium	**GR**	Greece	**NL**	Netherlands
BF	Burkina Faso	**HU**	Hungary	**NO**	Norway
BG	Bulgaria	**IE**	Ireland	**NZ**	New Zealand
BJ	Benin	**IT**	Italy	**PL**	Poland
BR	Brazil	**JP**	Japan	**PT**	Portugal
BY	Belarus	**KE**	Kenya	**RO**	Romania
CA	Canada	**KG**	Kyrgystan	**RU**	Russian Federation
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CG	Congo			**SE**	Sweden
CH	Switzerland	**KR**	Republic of Korea	**SI**	Slovenia
CI	Côte d'Ivoire	**KZ**	Kazakhstan	**SK**	Slovakia
CM	Cameroon	**LI**	Liechtenstein	**SN**	Senegal
CN	China	**LK**	Sri Lanka	**TD**	Chad
CS	Czechoslovakia	**LU**	Luxembourg	**TG**	Togo
CZ	Czech Republic	**LV**	Latvia	**TJ**	Tajikistan
DE	Germany	**MC**	Monaco	**TT**	Trinidad and Tobago
DK	Denmark	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**US**	United States of America
FI	Finland	**ML**	Mali	**UZ**	Uzbekistan
FR	France	**MN**	Mongolia	**VN**	Viet Nam
GA	Gabon				

CLOSURE WITH PLASTICS INSERT

The present invention relates to closures with a plastics insert of the sort commonly formed of deep drawn aluminium. Such closures are adapted to be secured to a container neck by rolling or other forming means after capping of the container.

The invention particularly relates to such closures formed with a female plastics insert having a thread on its interior and secured to the closure whereby said closure may be sealingly secured to a correspondingly threaded container neck to present a smooth finish to the exterior of the closed container.

Deep drawn container closures of this type are usually formed of a smooth crown portion from which depends a smooth skirt. Most preferably the smooth skirt terminates remote from the crown in a security band secured to the skirt via a plurality of spaced frangible bridges formed in said closure of the metal from which such a composite closure is formed.

On the security band portion of such a closure, adjacent the frangible bridges, and in use adapted to be inferior thereto, is an annular bead adapted to define a rolled depression in use to secure the security band onto a complementary formation on the container neck with which it is to be used. It will be observed that unscrewing the smooth skirt and crown portion from the neck causes the frangible bridge to fracture leaving the security band in situ on the container neck to indicate a first use.

In the forming of closures of this type, the outer is first deep drawn as a closed tube, usually of aluminium, but other equivalent metals can be used. As a separate step, formations such as beads and/or frangible bridges are formed by a

perforating and/or rolling step. The frangible bridges are formed by cutting and deforming inwardly the skirt material between the frangible bridges, leaving the bridge material intact and providing a number of annularly arranged slits therebetween. Quality control measures are then required to ensure that each bridge has been formed as is intended. This quality control measure is effected, inter alia, by utilising light transmission through each inward deformation between each bridge. This means that the deformations must be sufficiently wide to transmit light, and this also means that in practice the inward deformation of the material between the frangible bridges should be of the order of 0.20 to 0.30 mm, although relatively larger or smaller gaps can be successfully used in some cases, for example 0.15 to 0.40 mm.

This inward deformation raises a difficulty with the assembly of deep drawn closures with a plastics insert. Such a plastics insert must be a good interference fit within the skirt and crown of the rolled closure (hereinafter referred to as the "outer"), but it must also slide past the inward deformations adjacent each frangible bridge.

An assembly can be achieved by slightly increasing the thickness of the material forming the outer to give it sufficient strength, particularly when aluminium is used as the forming material. Thus, when the plastics insert is forced into the outer, it deforms the material adjacent the frangible bridges outwardly without other unwanted deformations of the closure. This, however, necessitates a smooth plastics insert and a relatively heavier gauge of aluminium material for the formation of the aluminium outer.

Since the material of the closure is discarded after use, it is obviously beneficial to provide a cap assembly with a minimum of material therein to achieve the desired shape and function of the closure.

We have now found that if the plastics insert is formed of a plastics material with an elastic memory, for example a polyalkylene such as polypropylene or polyethylene or a mixture of polyakylenes, or with other plastics material with similar characteristics, the insert may be radially compressed immediately before assembly and projected into the closure without significant deformation of the closure other than a slight outward flexion of the portions of the security band adjacent the frangible bridges. The plastics insert so engaged with the closure will gradually re-attain its decompressed state over 6-12 hours after forming, thereby locking the plastics insert into the closure without further securing steps.

According therefore to a first feature of the invention there is provided a process for forming a container closure with a plastics insert, which process comprises;
providing a drawn metal closure outer formed with a crown and a depending skirt and having an internal diameter,
providing a plastics insert formed of a material having an elastic memory, similarly provided with a crown and a depending skirt, said plastics insert having a maximum diameter which is an interference fit within the internal diameter of the closure,
delivering the closure outer (1) and the insert (6) to stations which are generally coaxially disposed,
compressing the insert to reduce its diameter and projecting the insert in its compressed state into the closure outer to firmly seat the same therein,
and subsequently allowing said insert to decompress towards its original diameter in situ.

A further problem associated with known closures of this type has been that the smooth plastics insert which has been required for assembly with a drawn metal outer, has sometimes allowed relative rotation of the closure assembly when the cap is first separated from the security band.

This is because the torque exerted on the smooth exterior of the prior art plastics insert shears any bond between the closure and the insert, particularly when the metal of the closure outer must be of a relatively heavier gauge in order to accommodate the seating of the plastics insert therewithin during the forming process. This, of course, can be overcome by utilisation of an adhesive, for example, but this involves the institution of a separate application step and presents other operational difficulties.

We have now found that by use of the compression forming step alluded to above, we can now use an improved plastics insert which comprises a plurality of ribs extending over the surface of the outer surface of the skirt portion of the plastics insert.

The precise action of these ribs is not fully understood. If the ribs extend radially outwardly significantly further than would the smooth diameter of the insert, they tend to deform the smooth line of the closure skirt material after such deformation of the plastics insert. However, we have found that after deformation the ribs cause increased torque between the plastics insert and the deep drawn outer closure member, even when the exterior diameter of the ribbed plastics insert is generally the same as that of a smooth plastics insert.

In a preferred form of the invention, the closure outer is coated with a suitable non-adhesive lacquer, for example a stoved lacquer. The stoved lacquer is most preferably an epoxy phenol curable lacquer which may be cured at 150^0-190^0C prior to assembly of the outer with the insert. Alternatively it may be a vinyl resin or a matt varnish. It is believed that although the lacquer is non-adhesive it acts to increase frictional forces between the outer skirt portion and the ribbed plastics insert. Thus, closures in accordance with the present invention may be provided with the minimum of metal and a ribbed plastics insert over the skirt portion and work

more effectively than those utilised heretofore.

Closures of this general type have been described before, in for example, GB-A-696662 which provides a drawn aluminium or similar metal closure assembly comprising an outer formed with a crown and a skirt portion, an insert for said outer formed of a plastics material, said insert having a surface portion which provides an interference fit between the crown and skirt portions of the closure outer. Our invention is characterised in that the surface portion of the plastics insert is ribbed and the insert has an elastic memory such that it may be radially compressed during assembly, and adapted to decompress after assembly so as to be restored towards its relaxed state within 24 hours. The % radial compression is preferably in the range of 1% to 5%, more preferably 1.5% to 4% .

Preferably a coating of a non-adhesive lacquer is disposed between the internal surface of the skirt of the outer and the plastics insert, whereby during removal of the closure from the container relative rotation between the skirt portions is prevented.

The ribbed portion of the insert may be formed of ribs in any convenient direction over the surface of the skirt. However, it is preferable to provide ribbed portions which extend parallel to the axis of the insert.

In order to achieve the improved closures in accordance with the present invention, the invention also embraces an apparatus for inserting a plastics insert with an elastic memory into a container closure outer as an interference fit which comprises;

means for delivering a drawn metal closure outer to a first station;

means for delivering the plastics insert to a second station generally coaxial therewith (and optionally superior thereto), a compression means comprising a through passage situated

about said coaxes and comprising an area of reduced dimension, and

ram means adapted to operate along said coaxes;

characterised in that when the closure is coaxially arranged relative to the plastics insert, the ram is operated to drive the insert through the passage thereby to radially compress the same prior to driving said compressed insert into the container closure.

The through-passage in the compression means may be also reciprocal along said coaxes and may be provided with a bell-shaped mouth directed toward said closure outer in use, whereby reciprocation of said passage, prior to operation of the ram,

locates the mouth of said closure to align the same on said coaxes prior to the forming step.

The delivery means may in each case be star wheels, each locating a sequential one of a plurality of inserts and closure members for delivery along said coaxes, and for removal of said closure assemblies after forming.

As stated above given that the material such as aluminium forming the outer is strong enough it is possible, and has been indeed the practice, to force the plastics inner into the metal outer as an interference fit without necessarily reducing the diameter of the plastics insert prior to the assembly.

This can require the outer to be formed of a relatively heavier gauge material to withstand the assembly forces. A consequence of this is that there is a tendency for the plastics insert to rotate relative to the outer during on- or off-screwing. This is because the interengagement between the drawn outer and the moulded plastics insert, although ideally an interference fit, is dependent for its efficacy on narrow manufacturing tolerances.

If the diameter of the plastics insert is too big the outer will deform, whereas if too small relative rotation during on or off-screwing can occur. This can be addressed by applying an adhesive between the outer and the plastics insert, but this gives rise to difficult manufacturing problems.

As specified herein a non-adhesive coating, preferably a semi lubricating coating, is also helpful but cannot prevent unwanted relative rotation if the diameter of the plastics insert is just too small.

We have now found however that this problem may be addressed in a further aspect of the invention wherein the skirt portion of the outer is formed with radially expanded annular band to define an annular space between the plastics insert and said band, the arrangement being such that during rotation of the closure relative to the container neck radially inwardly directed pressure, as exerted for example by a firm manual grip, causes inward flexing of the annular band thereby to point load the contact points between the edges of the annular band and the plastics insert. Where the annular band has a significant axial length, flexion gives rise to an element of mechanical advantage.

According therefore to a further aspect of the invention there is provided a drawn metal closure assembly comprising an outer formed with a crown and a dependent skirt portion, and an insert for said outer formed of a plastics material, said insert having a crown and skirt portion which provides an interference fit therebetween. The invention is characterised in that the skirt portion of the outer comprises a radially expanded annular band to define an annular space between the plastics insert and said band, whereby in use radially inward flexion of said band during rotation of the closure on a container neck point loads the point of contact between the peripheral edge or edges of the band and the plastics insert to alleviate the problem of relative rotation.

The band may have an axial length relative to the length of the skirt extending from the crown to the frangible bridges of the outer of 20% to 40%, and preferably about 30%. In a particular embodiment the axial length is preferably between 6mm and 12mm and is most preferably about 19mm which is just sufficient to be easily gripped by the index finger and thumb.

The invention will now be described, by way of illustration only, with reference to the accompanying drawings wherein:
Figure 1 shows a vertical elevation in part-section of a closure in accordance with the present invention,
Figure 2 shows a plan view from below of a plastics insert of Figure 1,
Figure 3 shows the operative portions in vertical cross-section of a cap forming machine embodying the process and closure assemblies of the present invention, and
Figure 4 shows a vertical elevation in part-section of a closure in accordance with the second embodiment of the present invention.

Figures 1 and 2 show a deep drawn aluminium outer (1) formed with a crown portion (3) from which depends a skirt portion (2). This outer (1) is deep drawn from an aluminium sheet 0.23mm thick and coated with a non-adhesive cured epoxy resin or a vinyl matt varnish. The skirt portion (2) terminates at its lower end in Figure 1, in a plurality of frangible bridges (10) which connect the skirt portion (2) to a security band (4). The security band (4) is formed with two parallel ribbed portions (11), the uppermost thereof being immediately adjacent the frangible bridges (10) to define a rolling annulus (12) whereby the closure, having been screwed onto the neck of a container, is secured thereto by means of rolling the area (12) to locate the same below a corresponding annular ring on the container neck (not shown). The deep drawn aluminium outer (1) encloses, as an interference fit, a plastics insert (6) which may have a radial diameter of 36mm

formed of a polyalkylene, preferably a polypropylene or polyethylene plastics material. This is formed with threads (7) for interengagement with corresponding threads on the neck of the container. The plastics insert (6) is provided with a support (13). The action of the support (13) and its flexibility is assisted by the incision of slot (8) into the crown portion adjacent the conjunction of the crown portion of the plastics insert (6) with the skirt portion (17) thereof. Extending over the crown portion of the plastics insert (6) is an expanded polyethylene liner (5) with a "Saran" (registered trade mark) facing located therein by means of lobes (14).

As can be seen from Figure 2, vents (15) are provided to the exterior of the plastics insert (6) to allow air to be evacuated from the outer during the assembly procedure. The support (13) is strengthened across the slot (8) by means of nibs (16), shown also more clearly in Figure 2.

Disposed longitudinally over the exterior of the skirt portion of the plastics insert (6) are a plurality of ribs (9). These are in use in tight sliding contact with the interior of the skirt portion (1). As may be seen from Figure 1, the neck portion of a container closure may be introduced into the closure via the security band (4) and the neck may be screwed on by a capping machine in accordance with known procedures until it is sealingly held within the body of the plastics insert. A slight elastic deformation of the aluminium outer skirt portion (2) ensures that the plastics insert (6) is locked upon the container neck without visual deformation of the eventual product. Subsequently a rolling step is instituted to secure the security band (4) to the corresponding formation on the neck of the container.

In use, anti-clockwise twisting of the skirt portion (2) is translated to the plastics insert (6) which, in turn, dislodges the closure from the container neck. Since, however,

the rolling step has caused the portion (12) to impinge under a formation on the container neck, the frangible bridges (10) are placed under increasing load to a point at which they fracture, thereby releasing the container cap (1) from the container neck. The cap (1) can, of course, be replaced in a sealing condition upon the neck of the container, but since the frangible bridges (10) will have fractured it will be apparent that the cap has been withdrawn. This closure is particularly suited for use with containers for spirits.

The process in accordance with the present invention is best shown in Figure 3. In Figure 3 a star wheel delivery means (20) is provided with a plurality of closure outers from a store thereof. The star wheel is indexed to a station in which is located about the coaxis (30) shown in Figure 3. It will be appreciated that each of the plurality of closure outers is adapted to reach said station about the coaxis (30), preferably simultaneously as a star wheel delivery means (21) delivers a plastics insert (6) to the coaxis (30) so that the plastics insert (6) is positioned directly over the closure (2). A ram (22) reciprocating in a direction "A" is also positioned on the coaxis (30) and may be reciprocated from the position shown in Figure 3 to a position within the body of the closure outer (2). The ram (22) is supported on two pillars (27), one of which is shown in part.

A reciprocating housing (24) is again provided about the coaxis (30) and is positioned between the star wheel delivery means (20 and 21). The housing (24) is provided, towards its lower end, with a restricted diameter portion (25) which in this case reduces the diameter by between 0.70 and 0.90 mm.

Further the reciprocating housing is reciprocal in the direction "B" between an upper position shown to the left-hand side of the drawing and a lower position shown to the right-hand side of the drawing of Figure 3. It will be appreciated that with the reciprocal housing in its upper position the

container closures (1) may be swung into position by means of the star wheel delivery means (20) and in the lower position as shown to the right-hand side of Figure 3 the upper end of the container closure is located by a belled locator portion (26) at the same time as the ram descends, so that the closure member is correctly located relative to the coaxis (30). It will also be noted that the restricted diameter portion (25) extends inwardly in the drawing relative to the internal diameter of the closure (1).

In use, with the arrangement set up as shown in Figure 3, the ram (22) is driven downwardly until it initially fits within the lobes (14) of the plastics insert (6) so as to ensure that the plastics insert (6) is correctly located on the coaxis (30). The plastics insert (6) is then driven down through the through-passage (23) in the reciprocating housing (24) until it reaches the area of restricted diametral portion (25) whereupon the insert (6) is reduced in diametral configuration by about 0.80 mm. In this condition it passes rapidly down into the interior of the container closure (1) brushing past the inwardly directed area between the frangible bridges (10) as it does so. This passage may reduce the gap in the areas between the frangible bridges (10), but does not close the same, and so has no effect on the functioning of the assembled closure.

At the end of its stroke, the ram (22) locates the plastics insert (6) with the crown portion thereof in abutment with the crown portion (3) of the container closure (1). The ram is then withdrawn, the star wheels are indexed by one portion of a turn, whereby the assembled closure is indexed to a liner insert station. The assembly is then removed and the process is repeated with a new container closure outer (1) being rotated into position against the retaining wall (28) and onto the coaxes (30).

The closure assemblies are then removed for a short storage

period prior to use. The storage period is preferably about one day, but in practice the closures may be used after 12 hours or so if necessary, or such shorter time as may be required in order for the elastic memory of the plastics insert to operate to allow relaxation thereof within the closure outer.

A further embodiment is shown in Figure 4. The features of Figure 4 which are identical to the arrangement shown in Figure 1 have been given the same annotation and are not specifically described again. The arrangement of Figure 4 shows a closure assembly of a second type having a diameter of about 30mm, utilised in the present invention wherein a disclosure outer (1a) is provided with a crown portion (3) and a skirt portion (2). Skirt portion (2) defines a raised annular portion (19). The outer (1a) is also provided with frangible bridges (10) to secure the skirt portion (2) to the security band (4). The security band (4) is again rolled on to provide a neck portion (12) after assembly of the closure with the container neck.

Also shown in Figure 4 is a container neck (17) provided with an annular security ring (17a), said container neck (17) being provided with threads (7a) for interengagement with threads (7) on the interior skirt portion of the plastics insert (6).

The closure outer (1a) is provided with an extended skirt portion (18) mainly for visual purposes.

The closure shown in Figure 4 is also provided with a liner (5) formed either of an expanded polyethylene material faced on the underside with a "Saran" coating, or with a pulp-board liner coated with a facing of polyethylene terphthalate available under the trade name "Melanex". Other liners used in the art may also be used, for example lines with a metallized coating thereon. The liner (5) is secured in position by means of lobes (14) much as shown in Figure 1.

As best seen on the left hand side of Figure 4 an inward deformation (10a) formed between the frangible bridges (10) is shown in its final form. It will be noted that as a result of the arrangement shown in Figure 4 the inward deformation (10a) is not closed, but leaves a small gap.

In use the plastics insert (6) is inserted into drawn outer (1a) either as previously described with the skirt portions (18) cooperating with the apparatus described in Figure 3 in the usual way, or by conventional methods. Once the plastics insert (6) is in situ in the skirt portion of the outer (1a), the closure may be screwed under moderate headload on to the threads (7a) of the neck (17) of a beverage container. Once the top of the neck of the container (17) is firmly in interengagement with the "Saran" face of the liner (5) the container having been so closed is subjected to a rolling step to insert the annular portion (12) thereby to locate the closure (1a) about the container neck (17) by contact of the interior of the annulus (12) with the under surface of the annular security ring (17a).

The closure (1a) may then be gripped and twisted off, whereupon the frangible bridges (10) will fracture leaving the extended skirt portion (18) in situ on the bottle or other container neck.

When the annular band (19) is gripped, for example by the index finger and thumb, it is squeezed to assist off-screwing. The effect of this is to point load the inner peripheries (19a) of the annular band (19) against the corresponding exterior of the plastics insert (6). This reduces the possibility of relative rotation between the outer and the insert and hence renders the closures of the invention less likely to fail under relative rotation even if a plastics insert is moulded under specification. Further the outer so formed allows for ready printing thereon.

This last arrangement is particularly suited to containers for table wine.

We have found that, when testing a number of closure members made in accordance with the present invention, the propensity for relative rotation of the container closure relative to the plastics insert both on first removal from the container neck in use, and subsequently, to be reduced relative to known closures using a plain plastics insert.

The closure outers, in accordance with the present invention, can be manufactured with the minimum gauge of aluminium and accordingly the minimum of aluminium material is discarded when the closure member has been used.

The invention relates, therefore, to a process for applying a specially shaped plastics inner into a drawn metal, preferably aluminium, closure outer; a closure assembly so formed; and to an apparatus adapted to assemble the same.

CLAIMS

1. A process for forming a container closure with a plastics insert (6) which process comprises; providing a drawn metal closure outer (1) formed with a crown (3) and a depending skirt (2) and having an internal diameter, providing a plastics insert formed of a material having an elastic memory similarly provided with a crown and a depending skirt, said plastics insert having a maximum diameter which is an interference fit within the internal diameter of the closure; characterised by delivering the outer closure (1) and the insert (6) to stations which are generally coaxially (30) disposed,
compressing (25) the insert to reduce its diameter and projecting the insert in its compressed state into the closure outer to firmly seat the same therein,
and subsequently allowing the insert to decompress toward its original diameter in situ.

2. A process according to Claim 1 wherein the means for compressing the insert is a through-passage (23) reciprocal (B) along the coaxis (30) between a first position which allows the closure to locate on or adjacent the coaxis, and a second position in which the open end of the closure is retained coaxially.

3. A process according to Claim 2 wherein the delivery of the closure and/or the insert is effected by indexed star wheels (20.21), a star wheel (20) acting to remove the closure assemblies after forming.

4. A process according to any proceeding claim wherein the plastics insert is formed of a polyalkylene material which is radially compressible by at least 5% and which is restored to its relaxed state within 24 hours.

5. A drawn metal closure assembly comprising an outer (1) formed with a crown (3) and a skirt portion (2), and insert

(6) for said outer formed of a plastics material said insert having a surface portion (9) which provides an interference fit between the crown and skirt portions; characterised in that the surface portion (9a) of the plastics insert is ribbed and the insert has an elastic memory such that it may be radially compressed during assembly and adapted to decompress after assembly so as to be restored towards its relaxed state within 24 hours.

6. A closure assembly according to Claim 5 wherein a coating of a non-adhesive lacquer is disposed between the internal surface of the skirt (2) of the outer and the plastics insert (6), whereby during removal of the closure from the container relative rotation between the skirt portions is prevented.

7. A closure according to either of Claims 5 or 6 wherein the surface portion of the insert is formed with ribs which extend parallel to the axis of the insert.

8. A closure according to any of Claims 5 to 7 wherein the amount of radially compression is in the range of 1.5 to 4%.

9. An apparatus for inserting a plastics insert (6) with an elastic memory into a container closure outer (1) as an interference fit which comprises;
means (20) for delivering a drawn metal closure outer (1) to a first station;
means (21) for delivering the plastics insert (6) to a second station generally coaxial (30) therewith;
a compression means (25) comprising a through passage (23) situated about said coaxis (30) and comprising an area of reduced dimension, and
ram means (22) adapted to operate along said coaxis;
characterised in that when the closure outer (1) is coaxially arranged relative to the plastics insert (6), the ram (22) is operated to drive the insert through the passage (23) thereby to radially compress the same prior to driving said compressed

insert into the closure outer (1).

10. An apparatus according to Claim 9 wherein the through passage is reciprocal (B) along the coaxis (30) between a first position which allows the closure outer to locate on or adjacent to the coaxis, and a second position in which the open end of the outer is retained coaxially.

11. An apparatus according to either of Claims 9 or 10 wherein the delivery means for the closure outer and/or inserts is effected by indexed star wheels (20.21); a star wheel (20) acting to remove the closure assemblies after forming.

12. An apparatus according to any of Claims 9 to 11 wherein the container closure outer is formed of aluminium sheet material.

13. A drawn metal closure assembly comprising an outer (1) formed with a crown (3) and a dependant skirt portion (2) and a plastics insert (6) for said outer, said insert having crown and skirt surface portions (9) which provide an interference fit between the crown and skirt portions of the outer and the plastics insert;
characterised in that the skirt portion of the outer comprises a radially expanded annular band (19) to define an annular space between the insert and the band, whereby in use radially inward flexion of said band during rotation of the closure on a container neck, point loads the point of contact between a peripheral edge of the band (20) and the plastics insert to alleviate the problem of relative rotation.

14. A drawn metal closure according to Claim 13 wherein the axial length of the annular band is between 6mm and 12mm.

FIG. 1

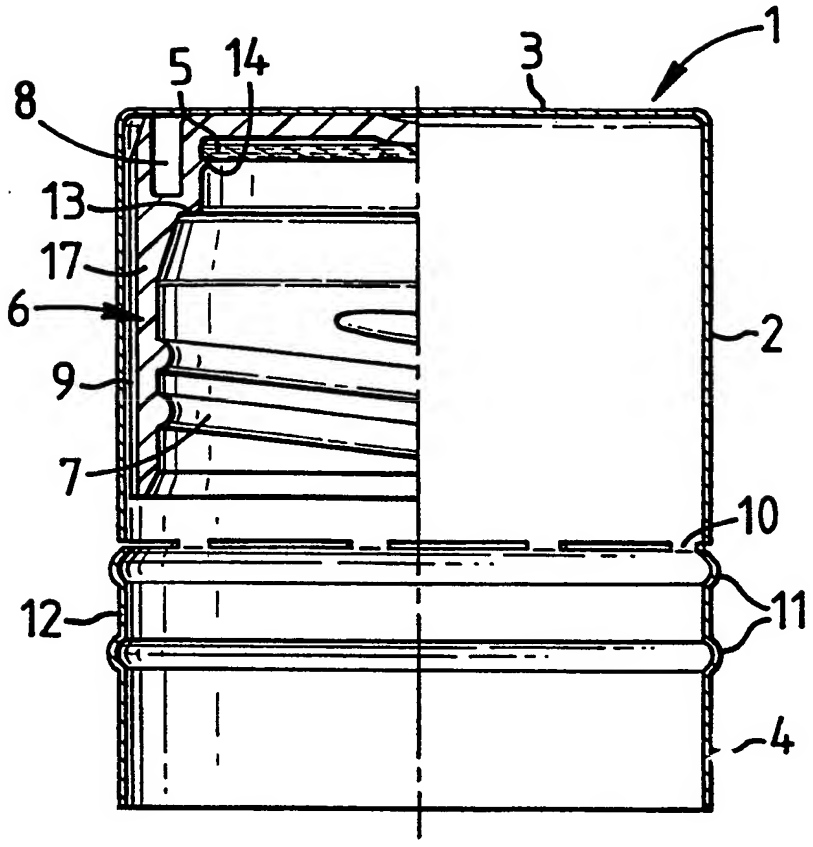


FIG. 2

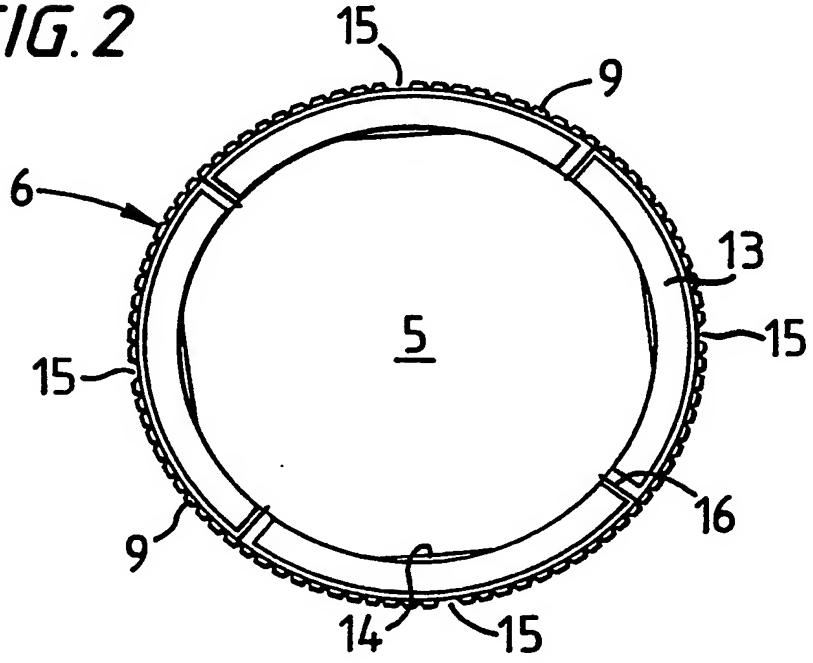


FIG. 3

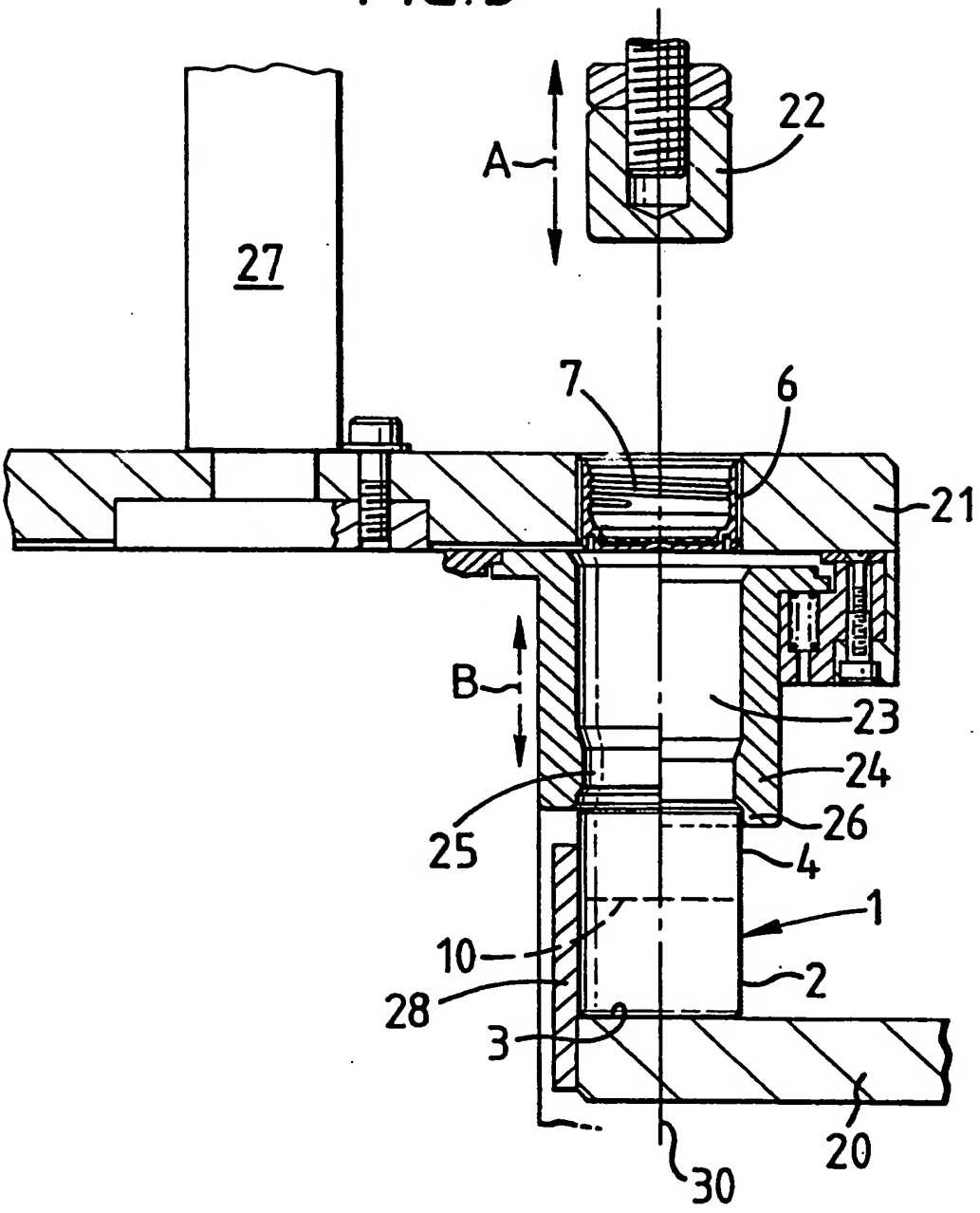
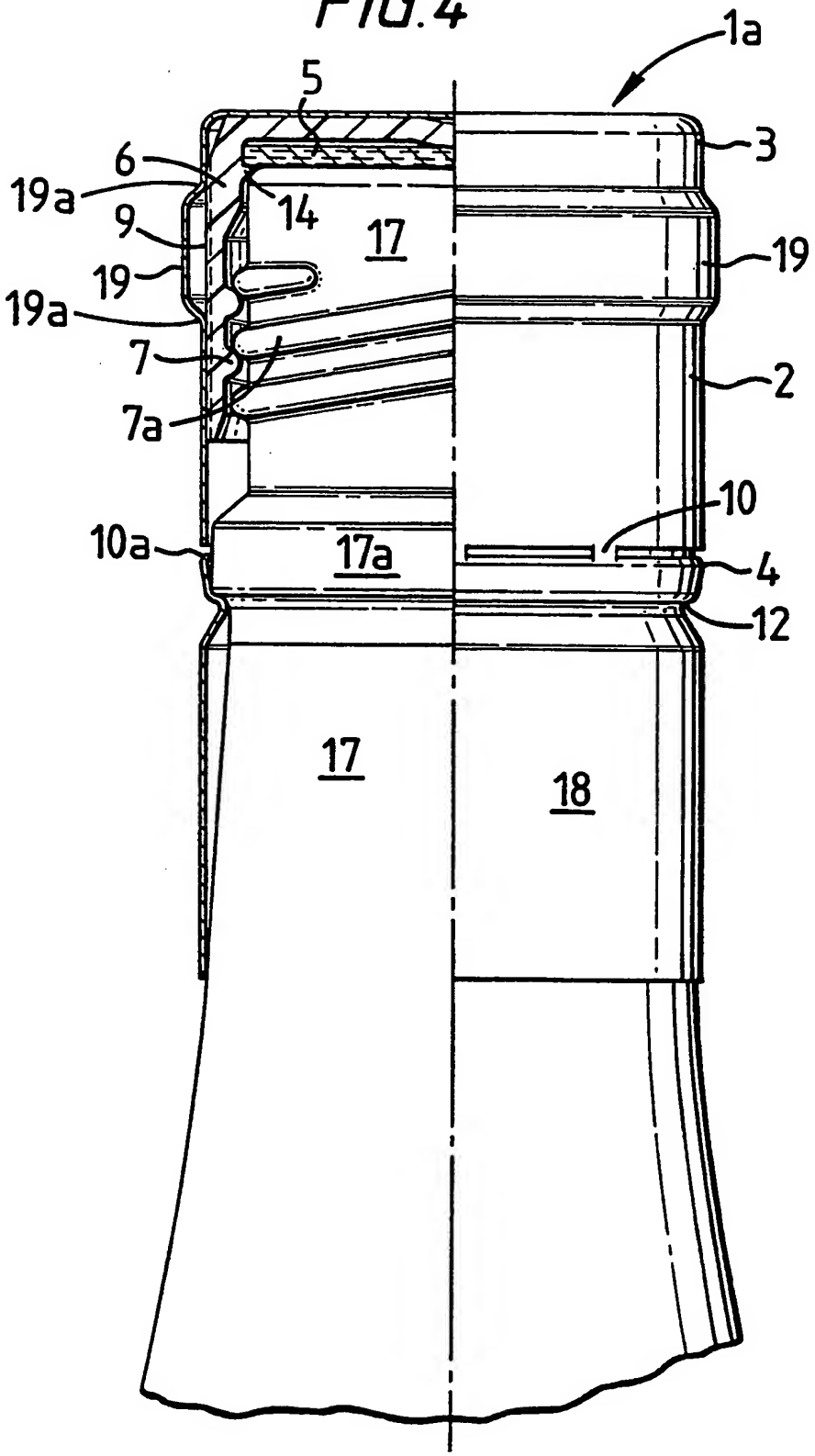


FIG.4



INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/GB 94/00341

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 B21D51/50 B65D41/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 B21D B65D B23P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,2 744 647 (WHEATON) 8 May 1956 see column 1, line 46 - column 2, line 50; claims; figures 1,2	1,5
X	FR,A,2 296 481 (SECMA) 30 July 1976 see claims; figures	1-3,9-12
X	FR,A,1 517 037 (COINTREAU) 15 March 1968 see the whole document	5
A	EP,A,0 515 260 (RICAL) 25 November 1992 see claims; figure 1	5,7
A	GB,A,696 662 (COTY INC) 2 September 1953 cited in the application	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 May 1994	07. 06. 94

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Peeters, L

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

.nformation on patent family members

Inte nal Application No
PCT/GB 94/00341

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-2744647		NONE	
FR-A-2296481	30-07-76	NONE	
FR-A-1517037		NONE	
EP-A-0515260	25-11-92	FR-A- 2676715	27-11-92
		AU-A- 1883392	30-12-92
		DE-D- 69200043	10-03-94
		DE-T- 69200043	05-05-94
		ES-T- 2048607	16-03-94
		WO-A- 9220589	26-11-92
GB-A-696662		NONE	